

Management Recommendations for
Niebla cephalota (Tuck.) Rundel & Bowler

version 2.0

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SUMMARY

Species: *Niebla cephalota* (Tuck.) Rundel & Bowler

Taxonomic Group: Lichens (Rare Oceanic-influenced)

ROD Components: 1, 3

Other Management Status: Oregon Natural Heritage Program: List 3 (more information is needed before status can be determined, but may be threatened or endangered in Oregon or throughout range); Natural Heritage Networks Rank: Global Rank G4 (not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences), State Rank S2 (imperiled because of rarity or because other factors demonstrably make it very vulnerable to extirpation, typically with 6-20 occurrences) (Oregon Natural Heritage Program 1998). BLM Tracking Status (USDI Bureau of Land Management 1998).

Range: *Niebla cephalota* is a North American coastal endemic, ranging from Baja California to Washington. In Washington, it is known from three locations: Roche Harbor, San Juan Island; Deception Pass State Park; and northwest Fidalgo Island. In Oregon, it is known from four locations: Sutton Creek Recreation Area and Spin Reel Campground, Siuslaw National Forest; Cape Blanco State Park; and Cape Arago State Park. In California, it is known from two locations: the Samoa Peninsula and Patricks Point State Park. Only three locations are on federal land.

Specific Habitat: In the range of the northern spotted owl, *N. cephalota* has been found on exposed Sitka spruce, Hooker's willow, Monterey cypress and shore pine in open forests, forest edges, and scrublands along windswept coastal headlands, sand dunes, stabilized deflation plains, and marshy swales of the immediate coast.

Threats: The main threats are activities that directly harm the populations, their habitat, or the suitable habitat surrounding populations. Examples of threats include: burning (in some places); harvesting trees; constructing roads, trails or buildings; recreational activities; grazing; invasive exotic plants; changes in local hydrology; and air pollution.

Management Recommendations:

- Manage known sites to maintain local populations and their habitat areas.
- Develop practices to route human use away from known sites.
- Manage fire in habitat areas, with emphasis on prevention near occupied substrates.
- Restrict removal of trees, shrubs, or other vegetation from the known sites and habitat areas, except when removal will not harm habitat integrity.

Information Needs:

- Visit known sites to describe the geographical extent of local populations, improve habitat descriptions.
- Determine if this species is closely associated with late-successional and old-growth forests.
- Determine if additional populations exist in areas identified as potential suitable habitat.

Management Recommendations for *Niebla cephalota*

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Niebla cephalota (Tuck.) Rundel & Bowler

Basionym: *Ramalina ceruchis* (Ach.) De Not. f. *cephalota* Tuck.

Synonyms: *Ramalina cephalota* Tuck.

Desmazieria cephalota (Tuck.) Follmann & Huneck

Niebla cephalota is a lichenized fungus in the family Ramalinaceae, order Lecanorales, class Ascomycetes (Tehler 1996). Within *Niebla*, *N. cephalota* is part of the “ceruchoid” group, species with a terpenoid chemistry and lacking well-developed chondroid strands (Bowler *et al.* 1994). *Niebla* is the Spanish word for “fog” or “mist”, a suitable epithet for the habitat of this species.

Niebla cephalota was first recognized as a taxonomic entity in 1882 by Tuckerman, who considered it a form of *Ramalina ceruchis*. Tuckerman himself later raised this lichen to the species level. In 1968, Follmann and Huneck transferred *Ramalina cephalota* to the genus *Desmazieria* Mont. But, the lichen genus *Desmazieria* Mont. was abandoned after Rundel and Bowler (1978) successfully argued that it was a homonym for the earlier legume genus, *Desmazeria* Dumortier. Because both were created in honor of the French botanist, J.B.H.J. Desmazières, the International Code of Botanical Nomenclature dictated that *Desmazieria* Mont., the later homonym, was invalid. To replace it, Rundel and Bowler created *Niebla*. Some members of *Desmazieria* were assigned to *Niebla*, the rest to *Ramalina*. *Niebla* is distinguished from *Ramalina* by the presence of either a thick palisade cell layer in the exterior cortex overlying supportive tissue or a simpler, less distinct cortex; the presence of black, usually abundant pycnidia; a high concentration of triterpenes; and unattached agglutinated hyphal strands in most species except the ceruchoid group (Bowler and Riefner 1995).

B. Species Description

1. Morphology and Chemistry

Niebla cephalota (Figure 1) is characterized by a fruticose thallus, 2-4 cm, tufted to drooping, pale greenish but often black spotted, in the herbarium becoming covered with filamentous crystals (with the appearance of mold); branches mostly < 2 mm diameter, roundish and pitted; soredia lateral, tinged with bluish-gray; spot tests negative except cortex KC+Y (McCune and Geiser 1997). Because the morphology is so variable, it can be mistaken for a parasitized *Ramalina*, especially the regionally common species, *R. farinacea*. The black spots are characteristic of the lichen rather than spots of infection, however.

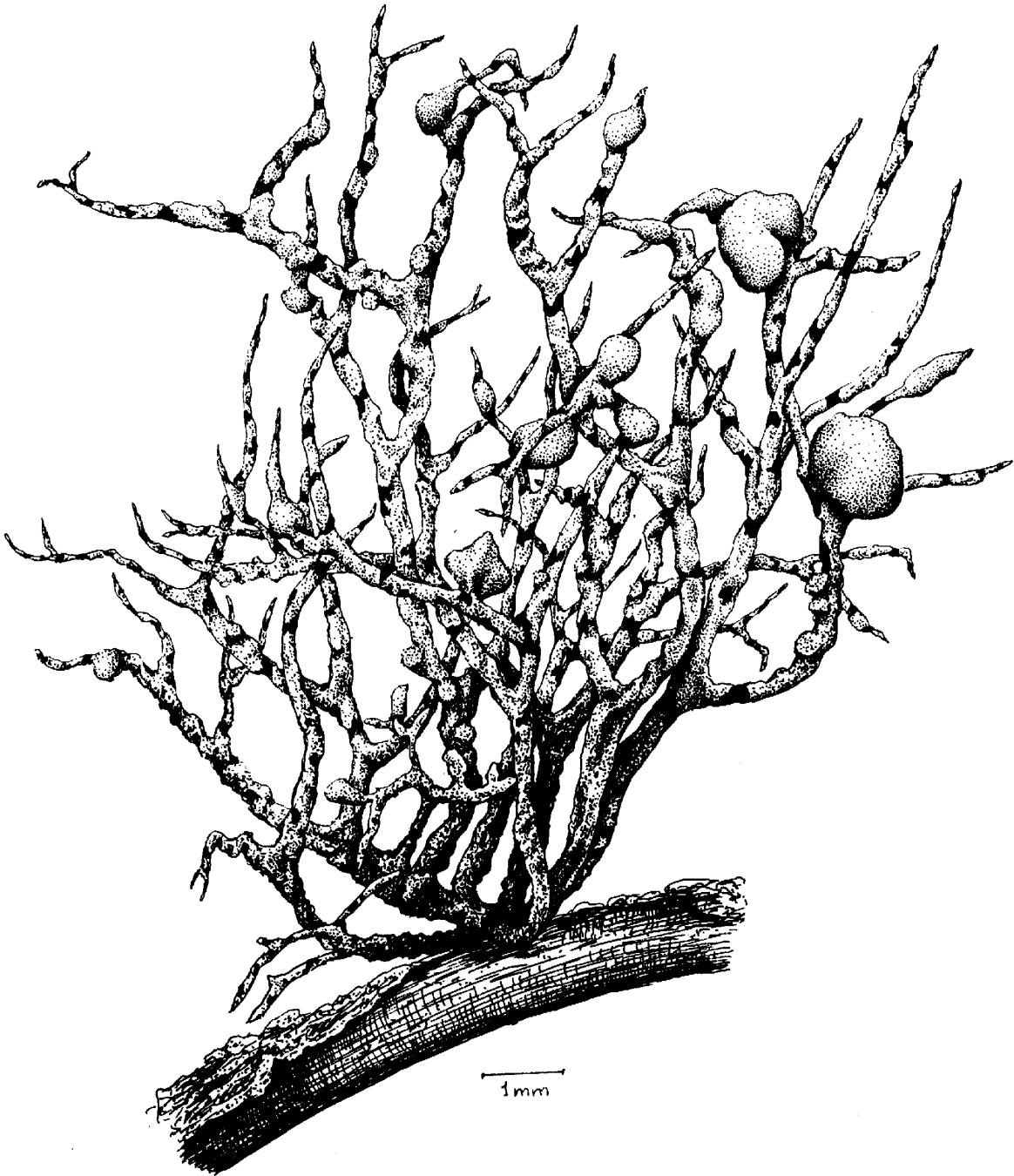


Figure 1. Line drawing of *Niebla cephalota* by Alexander Mikulin.

2. Reproductive Biology

Apothecia are unknown for this species. Asexual reproduction occurs by soredia. The microscopic size of the reproductive propagules should enable them to be carried long distances by wind, animals, or birds. Birds in particular are thought to enhance arrival rates of rare oceanic species like *N. cephalota* by dispersing lichen propagules along coastal migratory routes of the Pacific Northwest (McCune *et al.* 1997).

3. Ecological Roles

The genus *Niebla* is particularly well adapted to low annual rainfall, frequent overcast and fog with associated high humidity. In North America, these conditions are typically found along the California and Baja California coasts. In such habitats, species of *Niebla* and *Ramalina* can almost completely cover the branches of shrubs and other plants, and dominate ground surfaces such as rocks, loose volcanic cinders, soil, and even sand, and likely play a role in nutrient cycling (Rundel *et al.* 1972). Little is known about the ecological roles of *N. cephalota* in the Pacific Northwest. The closely related species, *N. ceruchoides*, functions as a seed trap and nursery for several vascular plants, specifically species of *Dudleya* (Crassulaceae), in areas farther south (Riefner and Bowler 1995).

C. Range and Known Sites

Niebla cephalota is endemic to western North America, ranging from Baja California north to Washington along the immediate coast. It belongs to a tropical genus with considerable species diversity and biomass along the coasts of southern California, the Channel Islands, and Baja California (Bowler and Riefner 1995). *Niebla cephalota* is the only species in the genus to range as far north as the Pacific Northwest. In Washington State, it is known from three sites, none on federal land. The land ownership for the Washington site in Roche Harbor on San Juan Island (San Juan County), is unknown because the collection record is vague. Recent Washington collections are from Deception Pass State Park (Island County) and northwest Fidalgo Island (Skagit County). Only two of the six Oregon collections are on federal land: Sutton Creek Recreation Area, Siuslaw National Forest (Lane County), and Spin Reel Campground in the Oregon Dunes National Recreation Area, administered by the Siuslaw National Forest (Coos County). Three Oregon records are from Cape Blanco State Park (Curry County), and one is from Cape Arago State Park (Coos County). The five California records are from the Samoa Peninsula (Humboldt County) and Patricks Point State Park (Humboldt County).

D. Habitat Characteristics and Species Abundance

Habitat characteristics and requirements of *N. cephalota* in the range of the Northwest Forest Plan, the northern extent of its distribution, are probably different for those farther south, where it is more common. Throughout its range, this species is found on trees, rocks, and shrubs and is restricted to the coastal fog belt. In the Pacific Northwest and northern California, *N. cephalota* has been found most often on exposed boles and branches of Sitka spruce (*Picea sitchensis*), but

also on Monterey cypress (*Cupressus macrocarpa*), shore pine (*Pinus contorta*) and Hooker's willow (*Salix hookeriana*). The species grows on forest edges of windswept headlands and sand dunes; at the edge of tree islands surrounded by moving dunes; as well as in sparsely forested estuaries and willow-dominated marshy areas. In one location it occurred on an old shore pine on the seaward edge of an old-growth Sitka spruce forest (McCune *et al.* 1997). All known sites within the range of the Northwest Forest Plan are less than 75 m (250 ft) elevation and within a few kilometers of the Pacific Ocean. Species abundance at known sites is undetermined.

II. CURRENT SPECIES SITUATION

A. Why Species Is Listed Under Survey and Manage Standard and Guideline

Niebla cephalota was considered at risk under the Northwest Forest Plan because of its rarity and limited distribution in the range of the northern spotted owl (USDA and USDI 1994a, 1994b). At the time, it was known from six sites in the range of the northern spotted owl (USDA and USDI 1994b). The viability ratings reflected a high level of concern for this species. The rare oceanic influenced lichens as a group received the lowest viability ratings among all the lichens considered (USDA and USDI 1994a).

Because of the low viability ratings and high level of concern, this species was identified as a Survey and Manage strategy 1 and 3 species (USDA and USDI 1994c), with the dual objectives of managing known sites and conducting extensive surveys to locate additional populations and identify other high-priority sites for species management.

B. Major Habitat and Viability Considerations

Frequent fog, and various ocean-influenced climatic, vegetative and soil factors, create the environment occupied by *N. cephalota*. Suitable habitats are sparse and are often separated by many miles. Given the limited availability of habitat, the high rate of human and natural disturbance to coastal habitats, and the slow colonization rates of *N. cephalota* (no large populations have been recorded), it seems likely that this species will continue to be rare within the range of the Northwest Forest Plan.

The major concerns for *N. cephalota* are the small number of known sites, the limited amount of suitable habitat for this species on federal land, and loss of populations from human activities that directly affect the remaining populations, habitat areas, or potential habitat. Climate changes, especially if they affect coastal fog regimes, and air pollution, are secondary concerns. Degradation or change in habitat conditions could affect the vigor of this species, possibly resulting in an even more restricted distribution or contributing to local extirpation.

Isolation of populations also leads to genetic isolation. Almost nothing is known about the genetics of lichen populations or the effects of gene pool isolation on local extinction rates of populations.

C. Threats to the Species

Threats to *N. cephalota* are those actions that disrupt stand conditions necessary for its survival. Such actions include treatments that reduce local populations by removing colonized bark or wood substrates; decreasing exposure to light; adversely affecting integrity of habitat areas; reducing or fragmenting potential habitat; or degrading air quality.

Recreational activities and developments may inadvertently alter the habitat of this species. Trampling by recreational vehicles and frequent foot traffic are serious threats, especially in shore pine woodlands and edge communities, as these degrade the habitat by disturbing fragile root systems of trees and shrubs, and the fragile protective mats of ground cryptogams, which stabilize the soil (Christy *et al.* 1998). Destabilization of the foredunes by recreationists or removal of European beachgrass (*Ammophila arenaria*) can destabilize tree island habitats of *N. cephalota* by increasing the amount of sand drift into them and burying trees on the perimeter (Christy *et al.* 1998). Buildings, roads, campgrounds and trails along the immediate coast have replaced many natural habitats to improve access, facilitate scenic views, or develop recreational uses.

Other threats to the integrity of habitat and potential habitat areas include logging, grazing, agriculture, and activities which alter local hydrology, or increase fire frequency (Christy *et al.* 1998). Concern about fire varies--many different plant communities and successional stages exist among the coastal dunes and headlands; fire is beneficial to some communities but damaging to others. Invasion or planting of exotics such as Scots broom (*Cytisus scoparium*), European beachgrass, tree lupine (*Lupinus arboreus*), birdsfoot-trefoil (*Lotus corniculatus*), and iceplant (*Mesembryanthemum* spp.) can have profound effects on nitrogen-poor dune soils by increasing nitrogen and soil moisture. These conditions foster invasion of other weeds, eventually disrupting native plant communities (Christy *et al.* 1998) and reducing plant and animal diversity (USDI 1997).

The air pollution sensitivity of *N. cephalota* is unknown. Species in a related genus, *Ramalina*, have a wide range of sensitivity (McCune and Geiser 1997, Boonpragob and Nash 1991). Because the primary habitat of this lichen is the coastal fog belt, and because fog significantly concentrates pollutants--especially acidic forms of SO_x and NO_x to which lichens are most sensitive-- the potential vulnerability of *N. cephalota* to air-quality deterioration is a reasonable concern. Although air quality is generally good at known sites, rising pollution emissions from increased traffic (mainly NO_x) and new or expanded point sources (SO_x and NO_x) in the Arcata/Eureka vicinity, and elsewhere along the coast, might threaten this species in the future.

Climate change affecting coastal fog patterns could be expected to affect the vigor of this species, possibly resulting in an even more restricted distribution or contributing to local extirpation.

D. Distribution Relative to Land Allocations

Niebla cephalota is known from only two sites on federal land, near Spin Reel Campground and Sutton Creek Recreation Area; both are administered by the Siuslaw National Forest. It was not clear at the time of writing whether the site near Spin Reel Campground is part of the Oregon Dunes National Recreation Area (Congressionally withdrawn) or just outside the Recreation Area. Sutton Creek Recreation Area on the Mapleton Ranger District, is administratively withdrawn and management emphasizes recreation. *Niebla cephalota* occurs on the Samoa Peninsula and may eventually be found in the Lanphere Dunes Unit (Humboldt Bay National Wildlife Refuge, USFWS). The Lanphere Dunes are managed to protect wildlife and native vegetation (USDI 1997).

III. MANAGEMENT GOAL AND OBJECTIVES

A. Management Goal for the Species

The goal for managing *N. cephalota* is to assist in maintaining species viability.

B. Specific Objectives

Manage populations at all known sites on federal lands by maintaining habitat and potential habitat immediately surrounding known populations.

IV. HABITAT MANAGEMENT

A. Lessons From History

Habitat destruction or alteration has made a significant contribution to the decline of lichens world-wide (Seaward 1977). Rare lichens, that occur in habitats optimal for human activities, such as the immediate coast, are especially vulnerable. At the northern Samoa Peninsula, on county and state land near the mouth of the Little River, the native dune communities have been nearly eliminated by the invasion of European beachgrass and human activities, and only a tiny fragment of the dune forest is left. Lichens are also absent from the southern end of the Peninsula's dune forest, where the trees are young and there is more off road vehicle evidence (Glavich, pers. comm.). At the Lanphere Dunes, even hiking has been documented to damage fragile shore pine/bearberry communities (Brown 1990). In coastal Oregon, activities of the past 140 years including increased logging, recreation, agriculture and grazing, fire, and changes in hydrology have significantly altered plant succession (Christy *et al.* 1998). For example, at Sand Lake dunes of Oregon, an area of high lichen diversity, off-road vehicles have destroyed nearly all the fragile shore pine woodland habitat in just thirty years (Wiedemann 1984, 1990 as cited by Christy *et al.* 1998).

Lichens have been known to be sensitive to air pollution for more than a century. Many species in Europe and eastern United States are in an active state of decline from sulfur dioxide, nitrogen oxides, and acidic deposition of sulfur- and nitrogen-containing pollutants (Ferry *et al.* 1973, Hawksworth and Rose 1976). Fog contains more dissolved ions and acidity than precipitation does (Wolseley and James 1992). Lichens that obtain most of their water from fog and dew are particularly vulnerable to air quality and weather pattern changes (Nash 1996). Follmann (1995) documented massive impoverishment and retrogression of lichens over much of the northern Chilean coastal fog belt over the past 20 years. Increasing frequency of El Niño events and gradually increasing aridity were postulated as likely, but not exclusively, causal factors in this decline. Species of *Niebla* and *Ramalina* are primary components of these communities. In the Pacific Northwest, sensitive species are already declining in some areas (Denison and Carpenter 1973, Taylor and Bell 1983) and lichens are identified as air quality related values in USDA Forest Service regional guidelines (Peterson *et al.* 1992).

B. Identifying Habitat Areas for Management

All known sites of *N. cephalota* on federal land administered by the Forest Service and BLM in the range of the Northwest Forest Plan are identified as habitat areas where these management recommendations should be implemented. A habitat area for management is defined as suitable habitat occupied by or near a known population.

C. Managing in Habitat Areas

The objective of managing in habitat areas is to maintain the habitat conditions for *N. cephalota*. Known habitat conditions are foggy coastal dunes and headlands with exposed old Sitka spruce, Hooker's willow, Monterey cypress, and shore pine.

- Determine the extent of the local population and habitat area with a site visit.
- Maintain suitable habitat around the current host trees and shrubs, so that the lichen may have adequate new substrate as current substrates decline.
- Develop practices to route human use away from the populations in habitat areas (for example, divert roads, trails and off-road vehicles). Trampling shrubs or cryptogam mats, compacting roots, damaging trees or branches that serve as substrates, introducing non-native species by seed dispersal or planting, can all adversely affect habitat integrity.
- Avoid harvesting trees, shrubs, or other vegetation from the population and habitat area unless these actions would do no harm to, or would improve, the habitat for *N. cephalota* (for example, by preventing deeply shaded conditions or by removing invasive exotics).
- Prevent fire in the population but utilize or prevent fire in habitat areas, depending on the role of fire in the plant community. Consider recommendations by Christy *et al.* (1998) for fire management in coastal plant communities.
- Maintain integrity of the foredunes where they protect habitat areas.
- Restrict commercial collection of moss, fungi or other special forest products if these activities would adversely affect the integrity of habitat areas.

D. Other Management Issues and Considerations

- Consider opportunities for managing known sites during Forest Plan and Resource Management Plan revisions, such as Botanical Special Interest Areas, Areas of Critical Environmental Concern, or other administratively withdrawn designations, or by prescribing special standards and guidelines.
- Provide information about conserving rare lichens at visitor centers or other locations along the coast to build public support of conservation efforts and to discourage collection of specimens.
- Continue to work with state and federal regulatory agencies to protect air quality on federally-managed lands from on- or off-site emissions, especially of nitrogen- and sulfur-containing pollutants.
- Share information with state and private sectors to further activities directed at conserving *N. cephalota*.

V. RESEARCH, INVENTORY, AND MONITORING NEEDS

The objective of this section is to identify opportunities to acquire additional information which could contribute to more effective species management. The content of this section has not been prioritized or reviewed as to how important the particular items are for species management. The inventory, research, and monitoring identified below are not required. These recommendations should be addressed by a regional coordinating body.

A. Data Gaps and Information Needs

- Determine if *N. cephalota* meets the criteria for being closely associated with late-successional and old-growth forests.
- Visit known sites to describe the geographical extent of local populations and their habitat.
- Determine whether additional populations exist in areas identified as potentially suitable habitat. Potentially suitable habitat is identified as stabilized deflation plain dunes and swales with Hooker's willow, and foggy, coastal, windswept headlands and dunes with scattered old Sitka spruce and Monterey cypress. Areas with the most potential suitable habitat on federal land include Sutton Creek Recreation Area, Gwynn Creek, Eel Creek Recreation Area, and interdune tree islands and scrub forests of the Oregon Dunes National Recreation Area, all on the Siuslaw National Forest; BLM parcels adjacent to Cape Lookout, and other coastal BLM parcels. Other under-explored federally managed land along the immediate coast include Olympic National Park seashore and the Willapa National Wildlife Refuge.
- Assign priority to Strategy 3 surveys in areas where management treatments or projects are scheduled or proposed.

B. Research Questions

- What are the dispersal and growth rates of *N. cephalota*?

- Which habitat characteristics are necessary for survival of *N. cephalota* propagules and colonies? Are some conditions unique to old-growth habitats critical to the survival of this species? Can stands be managed to mimic those characteristics?
- What are the minimum and optimum patch sizes of colonized habitat necessary to provide for *N. cephalota*?
- How can young managed stands along the immediate coast be managed to conserve and promote populations of rare lichens?
- What is the air quality sensitivity of *N. cephalota*?

C. Monitoring Needs and Recommendations

- Monitor known sites for changes in microclimatic conditions, successional changes, and for inadvertent habitat damage from human activities or wildfire.
- Monitor dispersal and population trends of existing populations.
- Monitor air quality near key populations of *N. cephalota* on federally-managed lands and assess threats to this species from present or projected air-quality trends.

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